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THE EPONYCHIUM AS THE POINT OF ENTRY OF FUNGAL INFECTION OF THE NAIL

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151(28), 1965, pp 713-716

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In specialized dermatological history we can find evidence to the effect that there can be various points at which a fungus infection can enter and reach the nail organ. Opinions on this problem have differed considerably so far. In earlier infections, the fingernail infection was recognized as occurring from the Margo liber, that is to say, via the subungual groove between the nail plate and the Matrix unguis. Gotz experimentally proved the possibility of this route of infection. That author performed an auto-inoculation by introducing fungus elements by means of a needle under the nail plate. Vilanova, on the other hand, was unsuccessful in placing the infection material on the subungual groove (about 50 negative samples). A certain group of authors (including Darier and Miescher) asserted that fungus invasion can take place from the lateral nail walls, not just in the form of an infection from the subungual groove. In 1952 Stuhmer assumed that, in the case of subungual trichophytia, which he described, the infection enters in the area of the nail root, whereby the mycelium moves under the nail distally. Vilanova and his associates furnished experimental proof that fungus infection settles most easily in the region of the nail root. The infection material, which was placed on the nail in the immediate vicinity of the eponychium, sprouted in 40% of the cases, whereby the mycosis symptoms occurred exactly in the field covered by eponychium; the author was able to achieve 28% positive results by means of this method, from the lateral nail wall. Infection samples from the hard nail plate surface proved worthless in this respect. We must emphasize here that these experimental infections were not long-lasting and that they healed up quickly in a spontaneous manner. The question now is whether we can come up with corresponding clinical findings for these convincing experimental samples and tests, that is to say, clinical findings which would confirm the fungus invasion in the vicinity of the nail root also in patients with mycosis. The author of this work was able to come up with a positive answer to this question in his histological research. It turned out that trichophyton mentagrophytes and trichophyton rubrum can penetrate via the eponychium. More than 150 nail sections taken from 32 patients made it possible to observe the individual stages of this process which derives its origin from the eponychium. The term eponychium here applies to the forward, horny edge of the nail wall. Its cells, which represent the

stratum corneum of the nail wall, were originally connected with the uppermost nail cells but morphologically speaking they definitely differ from the actual nail cells right below, nail cells which are produced by the matrix. The horn cells of eponychial origin are cast off during nail growth. On the other hand, we can observe the heaviest deposit of horn cells in the vicinity of the nail root. In my investigations I found that fungus elements can very easily settle here (Figure 4). The moistening of the eponychium during washing undoubtedly promotes the implantation process. Some of the fungi, which have penetrated into the midst of the horn cells of eponychial origin, penetrate deep between the actual nail cells which come from the matrix (Figure 5). Other fungus threads, on the other hand, grow in the eponychium itself and may get as far as the nail root (Figure 6). We have an antagonism here between the growth (speed and direction) of the fungus which pushes toward the nail root and the growth of the nail cells which advance distally. The expression of the fungus invasion through the eponychium is the clinical phenomenon of the so-called "ramified network" which becomes visible under a pocket magnifying glass (Figures 7 and 8). But this phenomenon can be clearly recognized after inunction and when the nail is properly illuminated. The network develops toward the nail root in the surface layer of the nail right next to the eponychium, where the nail tissue is not yet hardened. I announced this at the International Symposium of Medical Mycology in Warsaw last year as a new clinical-diagnostic nail trichophytia symptom. The development of the network as a result of the enzymatic effect of the fungus ferments upon the nail keratin was described by Alkiewicz and Sowinski in Arch khn exper Dermat [Archives of Clinical Experimental Dermatology], 1962. On the basis of the investigations described above, I am able to draw the following conclusions: (1) the point of entry via the eponychium plays an important role in pathogenesis of nail infection; (2) in the case of this invasion route, the fungi settle in the nail organ first of all between the horn cells and they penetrate into the nail as such only later. The second conclusion here, in my opinion, applies in the case of all fungus invasion routes; I became convinced of this on the basis of numerous histological preparations of mycotic nails. Wherever the nail is infected, the fungus infection originally takes place between or among the horn cells (stratum corneum) and only secondarily between the actual nail cells. Here are the practical conclusions of the above findings: (1) the excision of the eponychium as part of regular hand and foot care can facilitate the transmission of fungus infection; (2) in case of surgical removal of the nail (even when griseofulvin was used), it is necessary to perform a very careful curettage also from the eponychium side.

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Discussion: Kalkoff, Braun, Langhof, Bruchholz, Kleine, Natrop, Gertler, Alkiewicz.

FIGURE APPENDIX

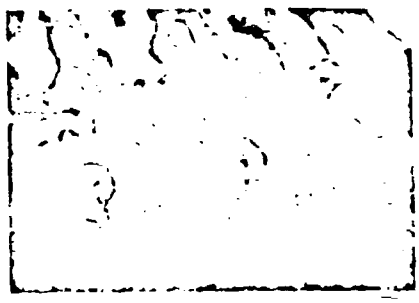

Fig 4. Fungus penetration from eponychium. Longitudinal cross-section through nail; fungus elements visible between superficial loose horn cells (microphotograph).

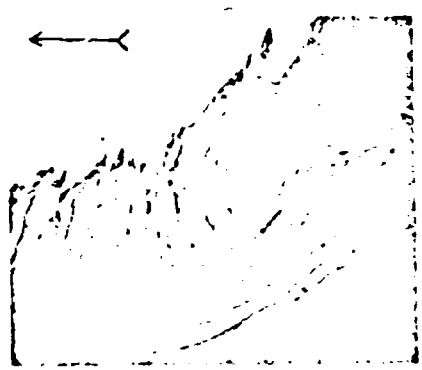

Fig 5. The invasion of the trichophyton fungus into the horn cells of the eponychium up to the actual nail cells of matrix origin. Longitudinal sections through nail (microphotograph). The arrow indicates direction of growth.

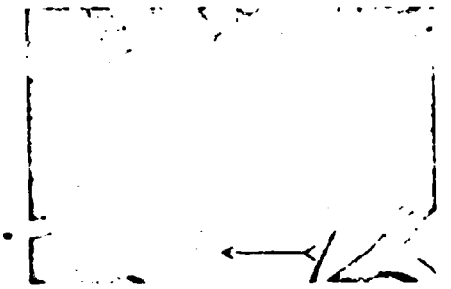

Fig 6. Fungus between horn cells of eponychium. The fungus threads grow in the direction of the nail root (microphotograph). The arrow points in the distal direction.

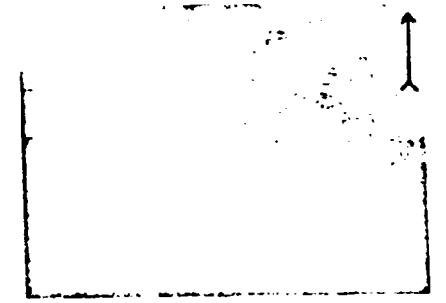

Fig 7. The "ramified network" of the nail in the eponychium region. Photo taken through magnifying glass. The arrow points in the distal direction.

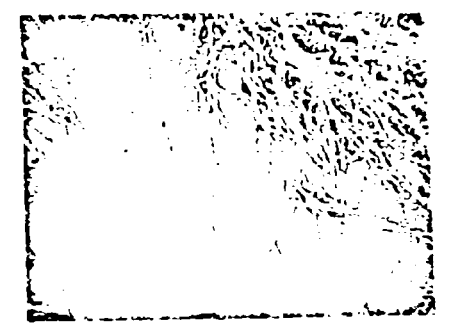

Fig 8. The "ramified network." Excerpt from Figure 7 (microscopic enlargement).